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Appl. No. 10/810,385  
Reply to Office Action of September 1, 2006

**Amendments to the Claims:**

This listing and version of the claims replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

1. (Currently amended) A method for repairing mask damage defects, the method comprising:
  - determining topographical information of a defect on a mask;
  - determining one or more grating repair specifications based on an optical simulation using the topographical information; and
  - forming one or more artificial grating areas on one or more sides of the defect based on the one or more grating repair specifications,
  - wherein the one or more artificial grating areas are no wider than a predetermined wavelength used for photolithography in which the mask is used, and
  - wherein the one or more artificial grating areas change the effective refractive index of a localized area encompassing the defect so that the defect does not cause an undesired image printing problem when the mask is exposed to a light source of the predetermined wavelength.
2. (Original) The method of claim 1 wherein the determined topographical information further includes phase depth information of the defect.
3. (Original) The method of claim 1 wherein the determined topographical information further includes a width of the defect.
4. (Currently amended) The method of claim 1 wherein determining one or more grating repair specifications further includes:
  - determining a phase change to avoid the undesired image printing problem; and
  - determining geometric specifications of the one or more artificial grating areas based on the determined phase change.

Appl. No. 10/810,385

Reply to Office Action of September 1, 2006

5. (Original) The method of claim 4 wherein the determining the phase change further includes generating aerial intensity and near field phase information for the defect.
6. (Currently amended) The method of claim 4 wherein the determining geometric specifications of the one or more artificial grating areas further includes determining a groove depth, pitch[, ] and grating space of the one or more grating areas.
7. (Original) The method of claim 6 wherein the determining a groove depth, pitch and grating space further includes:
  - selecting the grating space;
  - determining the groove depth;
  - determining a fill factor based on the selected grating space; and
  - determining the pitch based on the fill factor and the grating space.
8. (Currently amended) The method of claim 4 wherein the determining geometric specifications of the one or more artificial grating areas further includes determining a width of the one or more artificial grating areas.
9. (Currently amended) The method of claim 1 further comprising confirming the defect is being repaired by determining modified topographical information of the localized area and conducting one or more optical simulations using the modified topographical information.
10. (Original) The method of claim 1 wherein the mask is made of quartz.
11. (Currently amended) A method for repairing defects in a mask to be used for a lithography process using a light source having a predetermined wavelength under 193 nm, the method comprising:
  - determining topographical information of a defect;
  - determining one or more grating repair specifications based on an optical simulation using the topographical information; and

Appl. No. 10/810,385  
Reply to Office Action of September 1, 2006

forming one or more artificial grating areas on one or more sides of the defect based on the one or more grating repair specifications,

wherein the one or more artificial grating areas are no wider than the predetermined wavelength, and

wherein the one or more artificial grating areas change the effective refractive index of a localized area encompassing the defect so that the defect does not cause an undesired image printing problem when the mask is exposed to the light source of the predetermined wavelength.

12. (Original) The method of claim 11 wherein the determined topographical information further includes phase depth information of the defect.

13. (Original) The method of claim 11 wherein the determined topographical information further includes a width of the defect.

14. (Currently amended) The method of claim 11 wherein the determining one or more grating repair specifications further includes:  
determining a phase change to avoid the undesired image printing problem; and  
determining geometric specifications of the one or more artificial grating areas based on the determined phase change.

15. (Currently amended) The method of claim 14 wherein the determining ~~the~~ phase change further includes generating aerial intensity and near field phase information for the defect.

16. (Currently amended) The method of claim 14 wherein the determining geometric specifications of the one or more artificial grating areas further includes determining a groove depth, pitch[[,]] and grating space of the one or more artificial grating areas.

17. (Original) The method of claim 16 wherein the determining a groove depth, pitch and grating space further includes:  
selecting the grating space;  
determining the groove depth;

Appl. No. 10/810,385  
Reply to Office Action of September 1, 2006

determining a fill factor based on the selected grating space; and  
determining the pitch based on the fill factor and the grating space.

18. (Currently amended) The method of claim 14 wherein the determining geometric specifications of the one or more artificial grating areas further includes determining a width of the one or more artificial grating areas.

19. (Currently amended) The method of claim 11 further comprising confirming the defect ~~is being~~ repaired by determining modified topographical information of the localized area and conducting one or more optical simulations using the modified topographical information.

20. (Currently amended) A method for repairing mask pits on a quartz mask, the method comprising:

determining topographical information of a pit;

determining one or more grating repair specifications based on an optical simulation using the topographical information; and

forming one or more artificial grating areas on one or more sides of the pit based on the one or more grating repair specifications,

wherein the one or more artificial grating areas are no wider than a predetermined wavelength used for photolithography in which the mask is used, and

wherein the one or more artificial grating areas change the effective refractive index of a localized area encompassing the pit so that the pit does not cause an undesired image printing problem when the mask is exposed to a light source of the predetermined wavelength.

21. (Currently amended) The method of claim 20 wherein the determining one or more grating repair specifications further includes:

determining a phase change to avoid the undesired image printing problem based on aerial intensity and near field phase information for the pit; and

determining geometric specifications of the one or more artificial grating areas based on the determined phase change.

Appl. No. 10/810,385  
Reply to Office Action of September 1, 2006

22. (Currently amended) The method of claim 21 wherein the determining geometric specifications of the one or more artificial grating areas further includes determining a groove depth, pitch[[.]] and grating space of the one or more artificial grating areas.

23. (Currently amended) The method of claim 20 further comprising confirming the pit isbeing repaired by determining modified topographical information of the localized area and conducting one or more optical simulations using the modified topographical information.